

Bitola District Heating with Thermal Energy from TPP Bitola

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Skopje, 01.02.2011

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Project Team

- ▶ REK Bitola representatives
 - Mr Jani Radivchev
 - Ms Daniela Mladenovska
 - Mr Goce Nikolovski
- ▶ Municipality of Bitola
 - Goran Nedelkov
- ▶ Senior Technical Advisors
 - Prof Risto Filkoski
 - Prof Ilja Petrovski
- ▶ Team Leader
 - Igor Mishevski
- ▶ CCEI staff
 - Mr Hans Borchsenius
 - Ms Ann Iren Glimsdal
 - Ms Bojana Stanojevska

Introduction to project

- ▶ Analysis of possibilities for district heating of Bitola and two neighbour municipalities Novaci and Mogila
- ▶ Use of thermal energy from the Thermal Power Plant Bitola
- ▶ Analysis of effects and benefits that would be achieved by implementation of such project.

Technical findings

- ▶ TPP Bitola is a potential efficient source of thermal energy for district heating of the town of Bitola.
- ▶ The turbines in two out of three units of the TPP Bitola can be reconstructed to work as combined plant for electricity and heat generation
- ▶ Possible to supply thermal energy for district heating with capacity of 2x200 MWth

Temperature Regimes

- ▶ Hot water, in two-pipelines system, with temperature regime 130–135°C/75°C.
- ▶ Secondary networks would have temperature regime 90°C/70°C

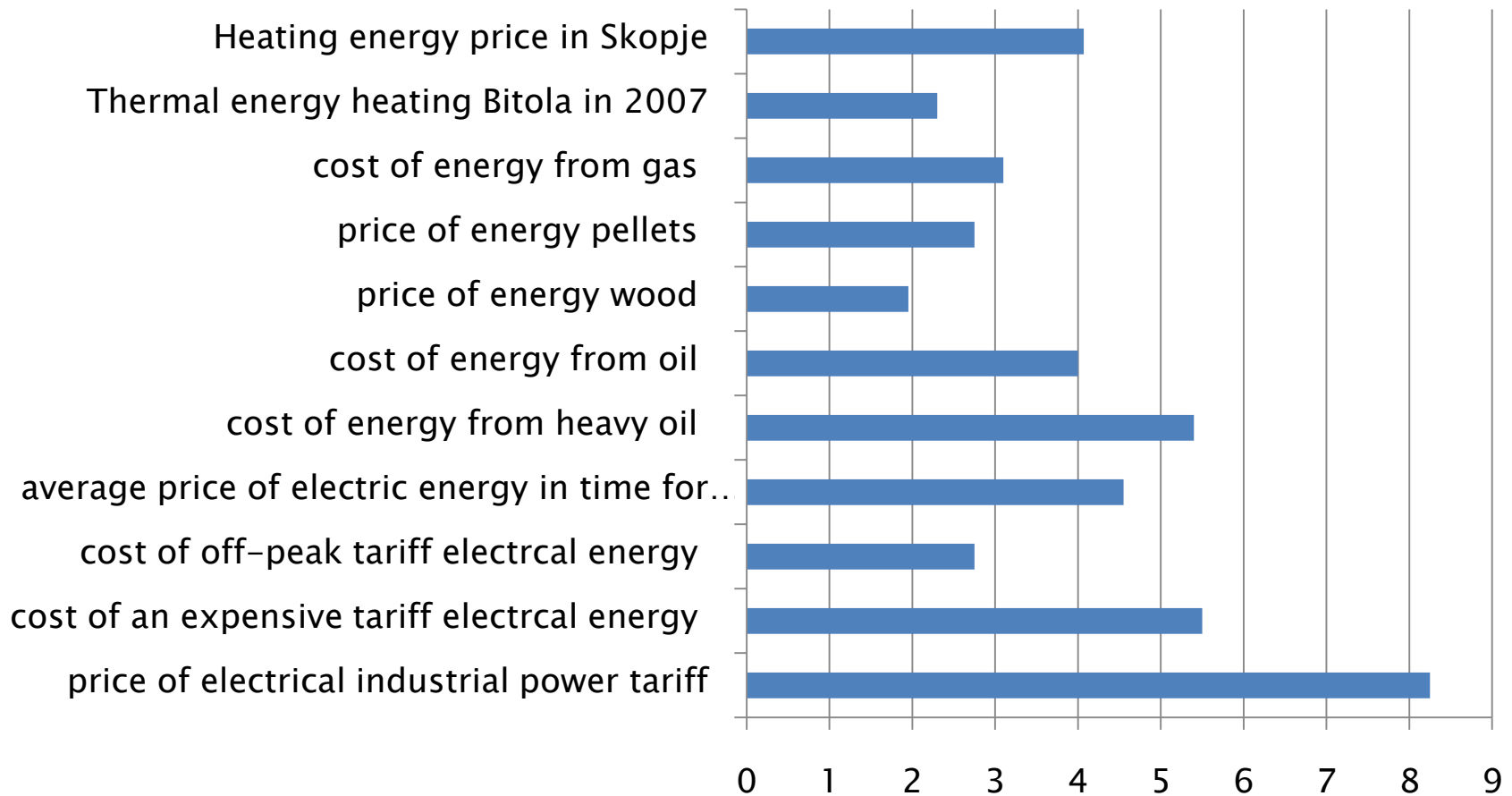
Heat vs Electric Power

- ▶ Heat supply in this type of power plant units means loss of approx. 0.18 MW electric power per MW thermal power
- ▶ Heat demand of 60 MW thermal power, as it is assessed for the first phase of the Bitola project implementation, results in approx. 11 MW reduced electric power

Environmental benefits

- ▶ Today Bitola is heated with wood, oil and electricity
- ▶ Installation of district heating would lead to
 - Reduced smoke concentration in winter from 50–60 mg/m³ to a below 20 mg/m³
 - Reduced SO₂ concentration from 160–180 mg/m³ to 10–15 mg/m³
 - Reduced CO₂ emission by 54000 t/year.

End user thermal energy price in MKD/kWh



Assumed prices

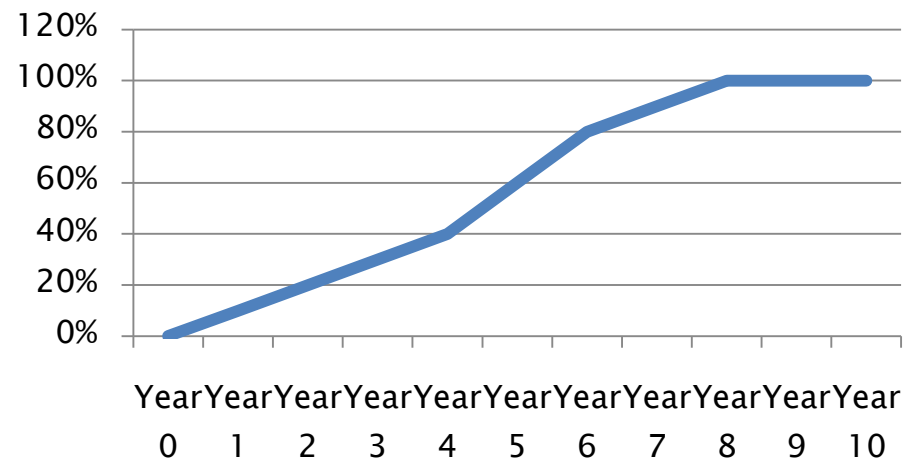
- ▶ Production price at threshold of TPP 0,4 – 0,74 MKD / kWh (with included gross margin)
- ▶ price of thermal energy for apartment 32,00 eur / MWh or 1,97 MKD / kWh
- ▶ price of thermal energy for businesses 49,00 eur / MWh or 3,01 MKD / kWh

Estimated Investment Cost

No.	Activity, equipment	Production Mil. €	Supply Mil. €	Total Mil. €
1	Investigation / research works, studies, basic design works	0.5	0.5	1.0
2	Buying land for pipeline tracing		1.0	1.0
3	Construction works, incl. terrain preparation	1.0	4.0 – 5.0	5.0 – 6.0
4	Energy equipment, facilities – procurement and installation			25.0 – 27.0
4.1	– Reconstruction of turbines	2.0		
4.2	– Heat exchanger & pump station	4.0 – 5.0		
4.3	– Hot-water pipeline (from TPP to the town and part of the town network)		15.0 – 17.0	
4.4	– Pump station for maintaining pressure level		2.0 – 3.0	
5	Electrical equipment	1.0	1.0	2.0
6	Other	1.0	2.0	3.0
	Total	10.5 – 11.5	24.5 – 28.5	35.0 – 40.0

Financial parameters

- ▶ Total investment **40 Million Eur**
- ▶ Income **14 Million Eur / year** (after 8 years)
- ▶ Economic lifetime = **20 years**
- ▶ Real interest rate = **4,5 %**
- ▶ NPV **34.645.019** % installed end user equipment
- ▶ IRR **11,03%**



Recommendations

- ▶ **Municipality of Bitola should take the lead in developing the distribution side of the project**
- ▶ **Production price (selling price from REK Bitola) 0.40 – 0,74 MKD/kWh thermal energy**
- ▶ **End user price should be 1,97 MKD / kWh for apartments and 3,01 MKD / kWh for businesses**
- ▶ **Complex project, political decisions in ELEM and in three Municipalities should be made.**
- ▶ **The project is feasible and profitable, IRR 11%**